ELECTRIC REFRIGERATION NEWS

The business newspaper of the electric refrigeration industry

VOL. I. NO. 6 — DETROIT, MICHIGAN, DECEMBER 22, 1926 — PRICE FIVE CENTS

NEW METHOD OF RATING PROPOSED

Engineers Propose Standard Tests for Household Refrigeration Equipment

Two papers presented by C. C. Spreen, chief engineer, Kelvinator Corporation, Detroit, and L. A. Philipp, assistant investigator, Engineering Research Department, University of Michigan, Ann Arbor, Mich., at the twenty-second annual meeting of the American Society of Refrigerating Engineers held in New York, December 6, 7 and 8, represent important contributions to the scientific development of electric refrigeration.

One paper, entitled "Service Tests on a Complete Standard Make Electric-Mechanical Household Refrigerator and a Recommendation for Rating Such Equipment," suggests two unit factors for comparing the performance or "efficiency" of different makes and sizes of refrigerators and household machines. It presents data of service tests carried out on a No. 4 Leonard refrigerator and a Kelvinator Junior compressor. A new and practical method of rating air-cooled machines of various evaporator design is recommended.

Another paper prepared by the same authors is entitled "Some Standard Engineering Tests for Mechanical Household or Small Mechanical Refrigerating Equipment." It describes the simple construction, calibration and operation of a flow meter for determining the capacity and volumetric efficiency of a standard household refrigerating compressor, also an improved calorimeter for the accurate measurements of the ice-melting capacity of the compressor. A curve is given for the volumetric efficiency of the compressor, and the relation between power consumption per 100 lbs. of refrigeration per 24 hours as a function of the room temperature is presented in graphical form.

In the paper first mentioned above, reference is made to a report of the Electric Refrigeration Committee of the National Electric Light Association which was presented at the convention of the association held in San Francisco, June 15-19, 1925, and which described the development of the household refrigeration industry, tabulating the results of tests carried out upon the equipment of various manufacturers of household machines. The report of these tests on the various machines "is the first published work of this kind." Attention is called to errors in the method of testing which were described in this early report.

Very Little Data On Tests Available to Engineers

In the second of the two papers presented by Mr. Spreen and Mr. Phillip the introductory remarks are as follows:

"Although the mechanical household refrigerating industry has grown very rapidly in the last few years, very little engineering data on tests or performance of various equipment has been available to the engineering profession. It is our purpose in this paper to describe two tests on a standard 'Junior Kelvinator' compressor unit and give the results of these tests.

"Several different types of test apparatus have been described, but this apparatus is troublesome to construct, and the results obtained from them cannot be relied upon as being very accurate. Papers of only a descriptive nature have been published in the journals and, as far as we have been able to determine, the only results of tests carried out on small machines have been published in Hull's 'Household Refrigeration.' Hull gave no description of the apparatus nor the method by which the results were obtained.

"The actual performance of standard equipment has either not been determined or the various manufacturers have failed to give the industry as a whole the benefit of their experience. It seems to the authors that the publication of the results which have been obtained with our simple apparatus will help to standardize the testing of smaller machines.

"The field of large refrigerating equipment has been standardized, but we believe that the results which can be obtained from tests on smaller equipment are susceptible to a greater accuracy than is possible with larger equipment, due to the greater ease in measuring the various intensity and capacity factors and to the closer control of conditions which affect their measurements. These tests are not claimed to be new in principle, but are the same as the tests used on larger machines, differing only in detail of apparatus and experimental procedure."

Electric Refrigeration Patents

A series of articles on electric refrigeration patents will appear soon in ELECTRIC REFRIGERATION NEWS.

Consider the Ice Man

By Ernest A. Dench

"He who knocks the iceman paves the way for retaliation in kind" is a good motto to keep above your desk. Negative publicity savours of "hitting below the belt." The iceman has a rightful place in the commercial world—a place which he has held for generations.

Naturally, he is sore at the inroads made into his business. The hulabaloo he makes is identically the same as when the barber thought he would be put out of business by the advent of the safety razor, yet his worst fears have not been realized; in fact, the barber is more flourishing than ever, thanks to the feminine bobbed and shingled invasion.

The iceman has had things his own way for these many years, and as soon as he gets over his present injured feelings, he will set to and adapt himself to modern competitive conditions.

While he is "touchy" it is best to ignore him. Goodness only knows there are enough electrical refrigeration advantages to expoit without betraying in your advertising that you "fear" the iceman.

Committee Appointed to Collect Electric Refrigeration Data

H. E. Young, of the Northern States Power Company, Minneapolis, Minn., chairman of the Electric Refrigeration Committee of the Commercial Section of the National Electric Light Association, has announced the appointment of a subcommittee to have charge of the collection of data and information on the subject of electric refrigeration, such material to be revieved and announced in short paragraphs in monthly bulletins to be published during the coming year. The following have been appointed members of the committee: Ell C. Bennett, editor, *Electric Light & Power,* chairman; Earle E. Whitehorne, commercial editor, *Electrical World;* and F. M. Cockrell, editor, ELECTRIC REFRIGERATION NEWS.

The next meeting of the Commercial Section will be held at the Edgewater Beach Hotel, Chicago, March 9-11, 1927.

C. W. MATHESON MADE VICE-PRESIDENT OF KELVINATOR, INC.

Sales Executive Formerly with Dodge Bros. and General Motors

A. H. Goss, president of Electric Refrigeration Corporation, announces that C. W. Matheson, of Detroit, has been made vice-president of Kelvinator Inc. and director of Kelvinator sales, effective December 15.

Mr. Matheson has for many years been actively identified with the automobile industry. For ten years he was associated with Dodge Bros., where he was directly connected at one time or another with every division of their sales operations. During 1920 to 1922, he was general sales manager and during his last two years with Dodge Bros., he was vice-president in charge of sales.

Upon leaving Dodge Bros., he became assistant to Alfred P. Sloan, Jr., president of General Motors Corporation.

Later, and for the last two years, Mr. Matheson has been vice-president and director of sales of the Oakland-Pontiac division of General Motors Corporation, in which capacity Mr. Matheson is said to have set up a new sales record in the industry, Oakland and Pontiac car sales under his direction having jumped from less than 45,000 in 1925 to over 130,000 in 1926.

The development of Kelvinator sales has been very rapid, both in the national and international markets, as the result of continual enlargment and reinforcement of the sales personnel. This addition to Kelvinator forces should add materially to the Kelvinator strength and capacity, and at the same time afford Mr. Matheson's world wide merchandising knowledge and ability full sway.

C. W. MATHESON

Last Call

The special introductory offer of a year's subscription for only fifty cents, or three years for one dollar, expires December 31. Thereafter, the rate will be seventy-five cents per year, or two years for one dollar.

While the new rate is extremely low, and even it can be offered for only a limited time, you are invited to take advantage of lowest rate while it is still available.

At the bottom of page 8 you will find a convenient coupon. Sign it now, clip and mail with check, money order or cash, and make sure that you will receive future issues regularly. Please act at once.

SUPERIOR AGAIN IN THE FIELD

New Group Takes Over Couzens' Interest

The Couzens Ice Machine Company, formerly controlled by Senator James Couzens, of Detroit, has been purchased by Superior Iceless Refrigerator, Inc., according to a recent announcement. The general offices of the new company are located in the Hanna Building, Cleveland, and the factory, which is producing Superior electric refrigeration units, is located in Wapakoneta, Ohio.

Senator Couzens decided to relinquish his interest in the iceless refrigerating business because he found the time-payment plan of selling an established trade practice, to which, in principle, he is opposed.

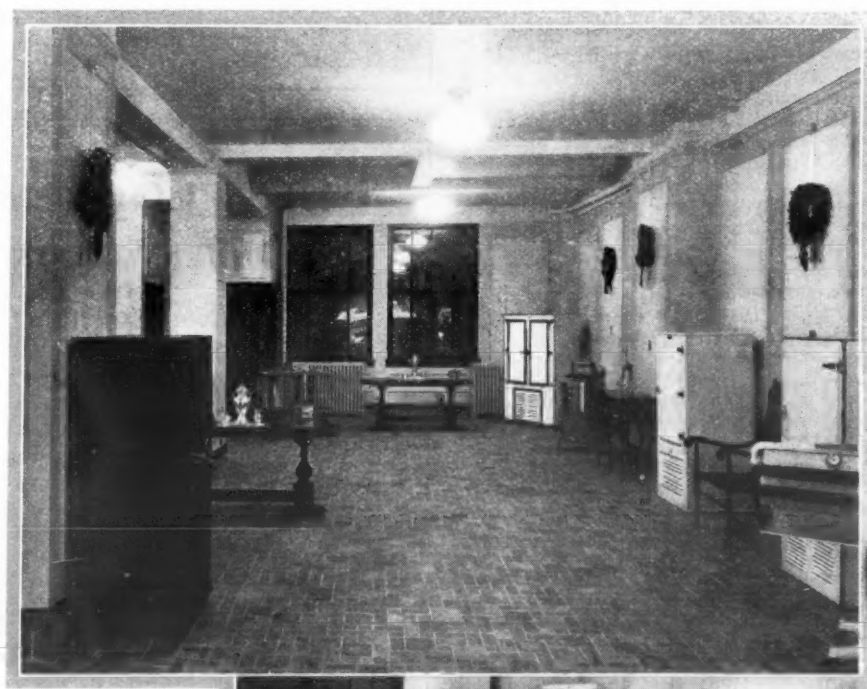
The new company is composed of a group of well known business men, headed by Charles A. Kolp, of Canton, Ohio, as president. Edward L. Frantz, of Cleveland, chairman of the board of the Apex Electric Mfg. Co., is executive vice-president of the new organization. Charles F. Carroll, of Cleveland, is second vice-president in charge of sales. E. E. Quirk, of Akron, is secretary, and M. J. Murphy, of Cleveland, is treasurer.

The "Superior," under which name the new company's product will be marketed, is one of the oldest iceless refrigerators in the field. It was first developed by Frank Andrews in 1914. Mr. Andrews is one of the recognized authorities on electric refrigeration in this country. He first built refrigerating machines as far back as 1909, and has had much to do with bringing Superior refrigerators to their present efficiency.

The Superior machine has been in successful operation for a great many years, and its distributors and dealers are located in all parts of the country. Under the new organization a sound, steady development of business is planned.

New Cooperative Exhibit Opened in Detroit

Prominently Located in New Michigan Theatre Building



Copeland, Kelvinator and Servel Electric Refrigerators Featured in Beautiful Ground-Floor Display and Demonstration Room Opened to Public December 15.

Other Nationally Advertised Electric Household Appliances Shown in Permanent Educational Display Managed by Electric Exhibit, Inc.

James H. McGraw Honored

Prominent engineers, public utility officials, publishers, manufacturing executives, and other industrial leaders, friends and business associates of James H. McGraw, president of the McGraw-Hill Publishing Company, met at a testimonial dinner given at the Hotel Astor, New York City, December 17, on the occasion of Mr. McGraw's birthday which marked forty years of service to engineering and industry. Thos. A. Edison was honorary chairman, and Arthur Williams, vice-president of the New York Edison Company, was chairman.

Sorco Company Becomes Gas Refrigeration Corporation

The name of the Sorco Manufacturing Co., Scranton, Pa., manufacturers of Sorco gas operated absorption refrigerators, has been changed to the Gas Refrigeration Corporation, with headquarters at 18 E. 41st St., New York.

Waller to Direct N. E. M. A.

Alfred E. Waller, for the past 17 years chief engineer of the Ward Leonard Electric Company, is now managing director of the recently formed National Electrical Manufacturers' Association. Prior to his connection with Ward Leonard, Mr. Waller was associated with the New York Edison Company. He has been very active in executive and committee work in engineering societies and associations for many years.

NEW COPELAND OUTLET IN PITTSBURGH

The Copeland Refrigerating Company of Pittsburgh has taken over the territory and property of the Heating and Refrigerating Company, distributors in Pittsburgh for the Copeland Products Inc., and in so doing has retained all of the interests and much of the organization of the latter, while adding new directors and new capital. The new company has a strong list of officers and directors and plans to greatly enlarge the distribution of Copeland products throughout Pittsburgh and the thirteen surrounding counties in Pennsylvania.

The stores and show rooms of the Heating & Refrigerating Company at Penn and Negley streets will be the headquarters of the new concern. The Copeland Refrigerating Company of Pittsburgh represents a capital of over $100,000 and will begin business at once with a complete line of new Copeland Products models, including all of the portable refrigerator cabinets in the line.

The officers of the new company are Joseph Dilworth, president; Hill Burgwin, vice-president; Eugene Herron, secretary and general manager, and Wayland S. Bowser, treasurer. The board of directors consists of E. W. Byers of A. M. Byers & Co.; Joseph Dilworth of Dilworth, Porter Co.; A. Rex Flinn of Bruce & Flinn, Limited; F. G. Guthrie of Edwards, George & Co.; W. D. McElhinny of Copeland Products Inc.; Charles Oliver of Oliver Iron & Steel Co.; Wm. R. Scott of Gordon, Smith, Buchanan & Scott.

Pacific Coast Visitor

N. A. Andruss, of 2345 Larkin Street, San Francisco, Calif., Pacific Coast agent for Roth Brothers electric motors and other electrical manufacturers, was in Detroit December 15. Mr. Andruss is making a very careful study of electric refrigeration with a view to becoming a distributor. He is visiting the various plants of the manufacturers, particularly those without distribution in his territory, in order to inform himself in detail regarding their equipment and methods of operation.

Back Issues Not Available

As previously announced, we are unable to supply back issues of ELECTRIC REFRIGERATION NEWS. Many requests are being received, especially for No. 1 and No. 2, but our stock is completely exhausted.

Taking the Mystery Out of Electric Refrigeration

A Non-Technical Explanation of the Principles Which Govern Its Operation

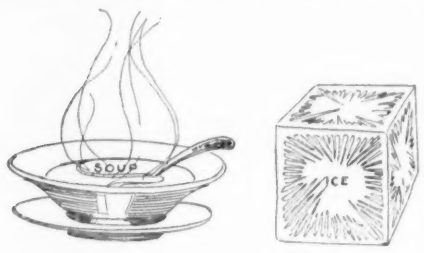
By C. U. Carpenter, General Manager, Frigerator Division, General Necessities Corporation

There is nothing mysterious about electric refrigeration. You know every "law" that governs its operation because you have seen these laws applied day after day. Let's strip this of its technical terms and get down to ordinary language in talking it over.

1st law. *Heat always travels from the hotter to the colder objects.*

It operates like water running down hill.

Now we might have a grand time explaining about the movement of the molecules, the scientific theory of heat transference, but let's forget all of this and consider a chunk of ice and a bowl of soup.



Put them in a refrigerator box and what happens? Why! the bowl of soup gets colder and the ice begins to melt. There you are! the heat in the soup is flowing through the air to the ice. This leads to the second law that you know all about.

Let's see now; here's your old chunk of ice—there's your hot soup. Heat from soup, heats the surrounding air. This travels to the ice and causes its melting. The heat then runs off in the water.

The soup deprived of its heat, gets colder. Right here is the weakness in refrigeration by ice. Ice refrigerates only through *its surface* absorbing this heat and the *surface ice melting*. The moment melting begins the area of the ice chunk grows smaller and therefore its refrigeration capacity grows less. The smaller it gets the less your refrigeration and the warmer grows the box and our plate of soup.

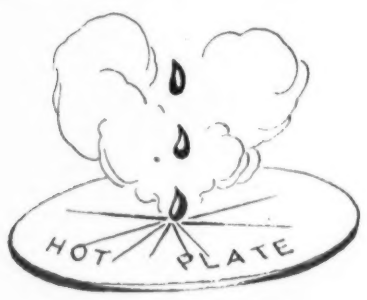
Now a piece of meat or milk and many other foods must be kept below 50° in temperature. Just let this temperature rise above 50° and the families of dangerous bacteria get busy, forgetting about birth control and begin to increase by the millions and billions. Then follows intestinal troubles that are so common.

An old fashioned ice box simply can't hold the proper temperature when the ice begins to melt.

2nd law: *When a solid is turned into a liquid by the application of heat, this heat is absorbed.*

When a liquid is turned into vapor (or in other words, when it boils) by the application of heat, then again heat is absorbed.

The vapor will be turned back into the original liquid if the heat contained therein is taken away from it by cooling.



The Red Hot Plate

Now get a steel plate red hot. Pour cold water on it. What happens? Why, the water is turned into steam and off it goes into the atmosphere.

But, in the turning of the water to steam, the heat is absorbed from the red hot plate and, after a while, the plate gets cold because the heat has been used up and taken away when the water turns to steam.

Hence this second law that (to use simple language) *"when a liquid boils heat is absorbed."*

3rd law: *Different liquids have different temperature points at which they boil.*

We are so accustomed to thinking of water boiling at 212° F., that we don't easily grasp the thought that different liquids boil at different temperatures. It's the one point that the average person cannot picture, and it is the biggest stumbling block in the way of a complete understanding of this subject.

You heat alcohol and at 173° F. it boils. Ether boils at 94° F., but sulphur dioxide boils at 14° F. That is to say, when sulphur dioxide reaches 14° F. it begins to boil just as water boils at 212° F., and when it boils it *absorbs heat.*

Methyl Chloride Boils at 10° Below Zero

When methyl chloride *reaches 10 F. below zero* it *begins to boil and when it does it gets busy absorbing heat units from anything warmer.* So you can easily see why ether, sulphur dioxide or methyl chloride refrigerates anything in a hurry. Imagine what happens to our plate of soup.

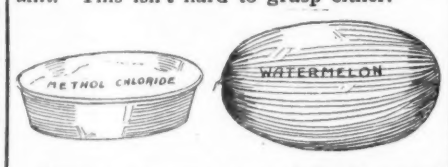
Outside of the difference in temperatures at which they boil the action of methyl chloride and sulphur dioxide is practically the same and I will therefore use the former in my illustrations.

Now the average man can't always grasp that idea. The conception of anything *boiling* at 10° below zero is entirely strange as he has always had that 212° boiling point for water in his mind. Yet it's no stranger than alcohol boiling at 173°.

It Solves the Problem

Anyway it's this fact that enables the manufacturer to secure refrigeration. You can now see that if you bring any object that is above 10° F. below zero near to liquid methyl chloride that heat will flow to it by the first law and the boiling and absorption of heat will immediately follow. The hotter object will get cold, of course.

That is the whole principle of refrigeration in a nutshell. Now; let's see how this is done through the use of a refrigerating unit. This isn't hard to grasp either.



Suppose we put a pan of liquid methyl chloride and a watermelon in a refrigerator box together and that the box had a vent to the outer air. Of course, the heat in the interior of the box, added to that of our watermelon, would start the methyl to boiling. Heat would be absorbed. The liquid methyl would thus be turned into a vapor (like water turns into steam) and soon the interior of the box and our watermelon would be very cold.

But methyl chloride is expensive and we can't afford to waste it so we have to devise some way of saving it.

Condensing

Of course, you know that if you turn water into steam and catch that steam you can condense it back into water again. You may not know it, but this is done simply by robbing those drops of steam of the heat that it accumulated when they were turned into steam. Therefore, if you catch it, in say, a coil and run cooling water or cool air over the coils, why then the heat therein is transferred again to the cooler element, the cooling water or air (law number one) and this heat being taken away, back into water it goes. This is in strict conformity with law number two.

Of course, you'll wonder why all the methyl chloride doesn't turn to vapor if it's going to boil at 10° below zero for certainly the surrounding atmosphere is not going to keep that low.

Here comes in law No. 4. *Where any liquid is subjected to pressure its boiling point becomes higher.* Think a bit and you will know it is true.

Pressure Affects the Boiling Point

Let your fireman in charge of your boiler at your factory increase the pressure on the boiler and you'll find he has to raise the temperature of the water higher before it boils.

Or, go up to the top of a high mountain, start a fire and boil some water. You know it will boil quicker because the pressure of the atmosphere is less, the higher you go.

This is one of the reasons for using a compressor, as I will explain later.

The liquid methyl chloride is placed in the unit in a receiver or in the bottom of the condensing coils; this liquid runs through a copper tube and then through a valve called the "expansion valve," which automatically controls its flow. Passing through this valve the pressure on it is relieved and it then, upon being subjected to heat in its uncompressed state, begins to absorb heat from surrounding objects, turning into a vapor.

Of course, we could lead this same tubing containing the vapor up to the top of the refrigerator and, by winding it into coils, get our refrigeration easily; for of course, the expanding vapor in the tubing would absorb the heat from the interior of the refrigerator and the vapor leaving the refrigerator would carry the heat with it.

But we want something there that will hold the cold in case anything should happen to the electric connection and the unit should stop.

The Brine Tank

We build up a tank which holds some solution (such as calcium chloride or alcohol and water) that will not freeze (except under very low temperatures) and place it in the upper corner of the refrigerator. Into this solution we lead the tubing and wind it into coils so as to get all the cooling surface possible.

Now! The first thing that happens is that the heat contained in this brine flows through the copper tubing into the expanding vapor and flows away with the vapor; therefore, the brine becomes very cold and itself absorbs the heat from the air in the interior of the refrigerator box.

This air, being cooler than any warm food placed therein, has been busy absorbing heat from this food.

There you are. The first law, that you know all about operating—heat traveling from the hot to the cold object. The heat from the watermelon travels to the cooler air—the heat from the air to the cold brine in the brine tank. The heat that's been transferred to the brine passes through the copper tubes goes into the methyl chloride because it has boiled and expanded and *must* take up this heat which it carries away. The watermelon loses its heat and becomes cold. Not so mysterious after all, is it?

Thermostatic Control

Of course, if we didn't control this operation the watermelon would freeze as solid as a brick. We do this by a thermostat which you set to operate and control the temperature of the brine within certain limits; say a low point of 40° and a high point of 45° by means of this, when 40° is reached this thermostat operates to cause the unit to stop operating. Then the temperature will rise, but when it gets up to 45° it again operates and causes the unit to begin its operation again.

This thermostatic device is so arranged that when the temperature reaches 45°, it then throws in an electric connection which causes the refrigerating unit to start operation. When the temperature is lowered to 40°, then the thermostatic control operates to break the electrical contact and the refrigeration unit stops operating. This difference in temperature may be varied.

The Ice Cubes

It is necessary to provide ice for various purposes. This is accomplished by placing a compartment within the brine tank in which compartment are placed shelves and upon these shelves rest removable trays. These trays are divided into small sections. The trays are filled with water, the heat from the water passes directly into the brine and from there into the coils and gas contained therein, until sufficient heat is extracted to cause freezing of the water into small cubes.

We thus see how simple our watermelon is cooled and the ice cubes are formed.

We now pass to the problem of saving the methyl chloride through a process which turns the vapor back again into liquid form:

We have seen how the methyl chloride vapor is now loaded up with the heat taken out of the refrigerator box and our watermelon. According to our "laws" that we have studied, we have seen that after an element such as water is turned into steam, it is possible to catch that steam and turn it back into water by robbing these minute drops of steam of the accumulated heat. This is done by cooling the steam either by a flow of air or a flow of cold water.

It is perfectly evident, therefore, that now having our methyl chloride turned into a vapor, because heat has been applied, we therefore, can turn this vapor back into a liquid form if we rob it of its heat. This plan of taking out heat is made effective by the use of our compressor and our condensing coils. You may wonder how the compressor helps in this plan, but it is really a very simple matter.

Let us say now that we have a certain given quantity of the methyl chloride vapor loaded up with a certain amount of heat (or a certain number of heat units). Suppose now we compress this gas into a volume of one-sixth as small as it originally was. It is now evident that having done nothing to get rid of this heat the same active amount of heat is contained within this much smaller volume.

When you admit this you will immediately see that this smaller volume of vapor will be much hotter than the original larger volume of heat laden vapor. We simply continue to compress the vapor and raise the temperature until it rises enough so that the heat will follow law No. 1 and flow to the air around the condenser coil.

It is now, then clear that it is a simple matter to extract heat from this very hot compressed vapor by subjecting it to a flow of air or water. Can you not see, therefore, that this robbing the compressed vapor of its heat units will condense it back into its liquid form?

The proposition is simply a common one of "when you add heat the methyl chloride boils and becomes a vapor and when you take away this heat from the vapor it turns back into a liquid."

The Compressor

We will make no attempt to describe the compressor in detail except to say that as the piston moves up and down in the cylinder it has both a suction action and compression action. Anyone who knows anything about automobiles will understand this.

The copper tube containing the vapor methyl chloride is attached to the crankcase. The piston on its upward movement creates a suction which draws the vapor, loaded up with heat units into the crankcase. On the downward movement of the piston the necessary valves open and admit this vapor into the cylinder above. On the next upward stroke this is compressed.

We thus see, therefore, that this vapor is now carrying in a much smaller volume the same nuumber of heat units and the temperature has been raised much higher.

The Condenser

This highly heated vapor is then led into the condenser which consists of 72 feet of copper coil.

We deprive the methyl vapor of this heat by blowing air on it from a high-speed fan of large capacity. Of course, in accordance with law No. 1 the heat held in the vapor has been traveling into the cooler copper coils. This air, blowing over the copper coils, and being cooler than they are, naturally picks up this heat and carries it away.

As clearly shown before, the vaporous content when deprived of its heat is condensed back into its liquid form and rests at the bottom of the condenser coil or in a receiver attached thereto and is ready to use over again. We have thus concluded the entire cycle.

You will, therefore, see that instead of this being a mysterious performance it is perfectly simple. The whole cycle of operation depends upon principles that everyone of us is aware of.

Briefly they are as follows:

Heat travels from the hot object to the cooler—when heat is applied to liquid it boils—when it boils it absorbs the heat and thus creates refrigeration. When the heat is removed from the vapor it is again restored to its liquid condition. These actions and reactions constitute the entire cycle.

This explanation is made in this non-technical form so that you may get a clear comprehension of it. Study it thoroughly.

In selling a refrigerating unit you will often find that a conference with the husband is necessary. The chances are that he, being familiar with automobiles and radio, will be very curious to learn "How an electric current can make both heat and cold." A simple explanation couched in terms of a plate of soup and a watermelon will serve far better than the use of technical terms that he doesn't understand and, worst of all, make the prospect think its too mysterious and difficult to fool with.

Announcement

A domestic refrigerating unit, ready for immediate production, may be purchased outright or secured on a participation basis.

It is the development of men of long experience in electric refrigeration engineering and design.

It is a straight engineering development, free from inventor's bad dreams, untried ideas or other sources of grief.

It is highly efficient, very compact, amazingly simple, exceptionally quiet running, and with fewest possible parts.

Associated with the owners, are men of extensive experience in appliance merchandising and who enjoy a close contact with important distributors.

These associates are prepared to put into effect a complete marketing plan if desired by the purchaser.

All inquiries from responsible parties will be promptly answered. Correspondence will be treated confidentially.

Box No. 7

Electric Refrigeration News

FLINTLOCK CONDENSERS

EFFICIENT—ECONOMICAL—COMPACT

Note Startling Comparison Below

Saves valuable space in installation.

Saves space in factory storage.

Saves power in operations—due to lower head pressure.

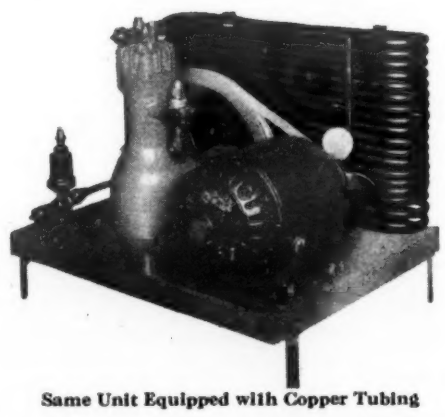
Increases accessibility for service.

Equipped with Flintlock

Lower first cost.

More cooling per pound of metal used than in any other known condensing unit.

Pressure up to 1000 pounds guaranteed without distortion leaks, or other defects.



Same Unit Equipped with Copper Tubing

FLINTLOCK CORPORATION

2102 Buhl Bldg. **Detroit, U. S. A.**

New Jersey Public Service Goes After Business Systematically

Salesmen Required to Pass Training Course—Prospects Assigned Daily—Newspapers and Direct Advertising Used—Meetings Held Monthly—Prizes Given Quarterly for High-Record Sales

BY R. W. T. RICKER

Public Service Electric & Gas Company of New Jersey serves a territory in the state comprising about five-sixths of the total population. The entire area served is divided into six divisions, each division being further subdivided into districts. The electric refrigeration sales organization is composed of 31 salesmen, who work from 24 local offices under the direction of merchandise assistants, who report to F. D. Pembleton, assistant to vice-president in charge of sales. Vice-president R. R. Young is in charge of all sales operations of the public service company.

Company Pays for Salesman's Correspondence Training Course

Before a salesman is sent out to solicit electric refrigerator business, he is given a week's sales course in the Kelvinator School and is also required to study and pass the correspondence course put out by the Kelvinator Institute. Here he is taught the principles of operation of the Kelvinator refrigerating unit, this make of machine being the only one sold directly by the company. The course is paid for by the public service company and given to the salesman.

Each morning the salesmen report to their particular local office, at which time the merchandise assistant furnishes them with a list of subscriber-prospects in a given street or section of the city. This method has been found to be particuarly efficient; the whole territory can be covered systematically, and the representative thereby has an entree by being able to call the customer by name.

In addition to the prospects, each salesman is given a list of users on whom he is also expected to call. These calls are in the nature of service, inasmuch as the salesman ascertains how the installation is working, makes an inspection of the equipment, and reports the need of repairs, if necessary, making any minor adjustments himself. He also endeavors to get the names and addresses of friends of the user, who are interested in electric refrigeration, and thus builds up a list of prospects for himself of those who have evinced interest. The salesmen work upon a straight commission basis of 15%, which has been found to attract a high type of man.

Twenty Local Service and Installation Men Employed

The machines are sold to the customer for cash, or on a deferred-payment plan of 18 payments which are added to the monthly service statements. The first three months of service is free to the customer. The company maintains a service department consisting of one general refrigeration installation and service representative and 20 local service and installation men throughout the territory.

The stock is carried in one or more central offices in each division from which it is distributed to the other offices in the division as needed. The company keeps a close watch on service calls and tabulates a quarterly report for each district upon which appears the name and address of the customer, date complaint was received, date of initial call, date complaint was completed and the nature of the complaint. A recapitulation of service calls shows the vice-president in charge of sales just how many service calls per unit per year are necessary and also total number of each type of service call. The extremely low rate of 1.233 calls per unit for the period of nine months testifies to the efficacy of the machine and of the installation and service department.

Letters Mailed Periodically to 25,000 Prospects—Follow Up by Salesmen

The company uses space in the local newspapers to advertise electric refrigeration, together with manufacturers' literature. A list of some 25,000 prospects are solicited by a letter from time to time, the letters being mailed from the nearest local office of the company and followed up by the salesmen.

To stimulate sales quarterly prizes are offered to the salesmen making the three highest records for the period. They are also encouraged in competing in national campaigns of the Kelvinator Corporation. Meetings of the salesmen and merchandise assistants are held monthly, at which meetings open discussions prevail after a short talk by a manufacturer's representative who is well versed in refrigeration.

At the present time there are in the neighborhood of 3,000 household electric refrigerators on the lines of the Public Service Electric & Gas Company of New Jersey, also about 3,000 electric ice cream cabinets and about 1,000 commercial installations of electric refrigeration equipment (other than ice cream cabinets).

SUMMARY OF SERVICE CALLS DURING PERIOD

TYPE OF SERVICE	No. OF CALLS
Thermostats	
Expansion Valves	
Belts	
Motors	
Leaks	
Tanks	
Pulleys	
Compressors	
Inspections	
Miscellaneous	
Unnecessary Calls	
Total	

No. of Units on Lines (end of last period)	
" " " installed (during period)	
Total No. of Units on Lines (end of period)	
Total Service Calls during period	
Service Call per Unit on Line	

Noted: _____ Division Agent

Signed: _____ Agent

This report to be submitted to Vice-President in charge of sales, through the Division Agent, not later than the 10th of the month following the period covered.

How a Department Store Cools Air and Water

Refrigerator Cabinets in Cafeteria and Store Drinking Fountains Cooled by 75-Horsepower Units

There are three distinct kinds of electric refrigeration used in the J. L. Hudson Co., Detroit department store, and each is operated by the 2 forty-ton Kroeschell ice machines in the third basement. These machines were installed a year ago and are used principally to cool the refrigerator cabinets of the cafeteria on the 14th floor. Another function is that of cooling the 20,000 gallon water tank that supplies the 60 drinking fountains in the store. The third use is the freezing of 24 fifty-pound cakes of ice every eight hours. This ice is used in the spring water-coolers located in the different store offices.

The ice machines are the CO_2 type and are driven by 75 horse-power motors. They are manufactured by the Brunswick Kroeschell Company, and are shown at the far end of the runway in the picture.

In the left foreground is shown one of the three air conditioning machines which cool the air that is supplied to the main floors and basements. The warm air of the store is forced through sheets of water, flowing through these machines, and in this way is cooled and de-humidified.

REFRIGERATION AND RADIO BENEFIT LUMBER INDUSTRY

"Radio has opened up such a market for lumber that there have been times during the last year when lumber used in cabinets in certain sections was more than went into house building," according to an article in the *Detroit News*. Radio cabinets and shipping boxes demand hard and soft lumber in enormous quantities.

The electric refrigeration industry is also calling for lumber on a large scale, and no doubt the 1927 requirements will far exceed those of any previous year, regardless of the tendency toward metal cabinets.

Wages Proportional to Power Used

In Great Britain the electric and mechanical power behind each worker is about half that in the United States, and wages are in about the same proportion. In Japan power per man is one-fourth, and wages one-fourth. In China there is practically no power, and wages are next to nothing.

HOW U. S. FAMILY SPENDS "ELECTRICITY MONEY"

Electric Refrigeration Expense Apparently Negligible

According to a news item released by the Society for Electrical Development, New York, "the average family in the eastern part of the United States spends 83 per cent of its 'electricity money' for lighting each month and 13 per cent to operate electric irons. A survey of 6,512 electric light company customers in 10 eastern states shows that the balance of the average dollar paid for electric service divides thus: Washers, 1 per cent; toasters, 0.8; cleaners, 0.7; bowl-type heaters, 0.3; coffee percolators, 0.3; curling irons, 0.08; grills, 0.08; electric fans, 0.06; sewing machines, 0.05 per cent."

What about electric refrigeration? Is the total so small that it does not affect the average dollar, or was it overlooked in the survey?

Plan to Complete Code

Dr. P. G. Agnew, secretary of the American Engineering Standards Committee, 29 W. 39th street, New York, has recently taken action looking toward the final revision of the Mechanical Refrigeration Code. A meeting of representatives of the various organizations concerned will probably be held early in 1927.

Where The Jewett Refrigerator Company Stands in this Industry

For 77 years JEWETTS have been building refrigerators in Buffalo. They have never attempted to meet popular demand and produce "the greatest number" of refrigerators. They never built a refrigerator to meet a set price. As the art progressed, JEWETTS always have been pioneers in the development of improved design, finer materials and better construction.

Commercial Refrigerators:

In this field JEWETT stands supreme. The installations in leading hotels, hospitals, clubs, restaurants, etc., is not equalled by all other makes combined. Many of these installations have been in continuous operation for more than thirty years and are still in perfect condition. As practically all these jobs are used with large central refrigerating plants, of course the requirements of mechanical refrigeration are nothing new to the Jewett Co.

Dealers and Central Stations prepared to make commercial installations are requested to send for Folder 103—which illustrates and describes JEWETT Commercial Refrigerators—not merely converted ice-boxes, but a line designed for use with any of the standard makes of units.

Domestic Refrigerators:

In this field, also, JEWETT experience predates that of any of the existing firms manufacturing units—most of the "experimental" work on cabinets having been done previous to 1914. Since then they have cooperated with almost every manufacturer who has ever tried to develop a household unit.

In addition to the famous SOLID Porcelain JEWETTS, the company is now making "porcelain enameled" self-contained cabinets for several large manufacturers. JEWETT experience, skill and facilities are available to other manufacturers who want to contract for a line of cabinets built to their particular requirements.

To correct any erroneous reports to the contrary, the Jewett Co. is still owned and operated by the direct descendants of the original founder. It does not manufacture refrigerating machines of any kind and is not controlled by any company making such units.

The JEWETT REFRIGERATOR COMPANY

UNCOMPROMISING QUALITY SINCE 1849

BUFFALO, NEW YORK

ELECTRIC REFRIGERATION NEWS

The Business Newspaper of the Electric Refrigeration Industry

PUBLISHED EVERY TWO WEEKS BY

BUSINESS NEWS PUBLISHING CO.

409 East Jefferson Avenue, Detroit, Michigan

Telephone: Cadillac 4445

Subscription price: (introductory offer) 50 cents per year; three years for $1.00

Foreign subscription price $1.00 per year. Advertising Rates on Request

F. M. COCKRELL, *Editor* — GEORGE H. HOWELL, *Business Manager*

H. A. DELASHMUTT, *Managing Editor* — F. B. RILEY, *Technical Editor*

R. W. T. RICKER, *Contributing Editor*

Copyright 1926 by Business News Publishing Co.

DECEMBER 22, 1926

Good Wishes

To our subscribers, advertisers, contributors and friends who have co-operated so helpfully and enthusiastically in making these early issues of ELECTRIC REFRIGERATION NEWS a real service to the industry, we take this opportunity to thank you most heartily and to wish you a Merry Christmas and a Most Prosperous New Year.

It is our firm belief that 1927 holds forth the possibility of being, by far, the most satisfactory year in the history of this young and aggressive business. It is our sincere hope that 1927 will prove to be a year of progress and of profit to all those who have given so freely of their time and effort to make electric refrigeration a real and satisfactory service to the public.

A Fair Question

In a letter to the editor of ELECTRIC REFRIGERATION NEWS, Jas. B. Gilmer, president, Kelvinator San Antonio Company, San Antonio, Texas, writes:

> "May I be permitted to ask just what beneficial idea was in view, in reproducing on front page of Nov. 20th "Electric Refrigeration News" the article headed 'Undesirable Publicity from Accidents.'
>
> "I like to have your publication on our magazine table in display room, but if articles of that nature wherein you admit the publicity is undesirable, but still you pass it along, are to be printed from time to time, it will need censuring before letting it get out of my hands."

Mr. Gilmer asks a fair question, which we will endeavor to answer.

First, ELECTRIC REFRIGERATION NEWS has been established as "The business newspaper of the electric refrigeration *industry.*" It is edited primarily for the benefit of manufacturers, distributors, dealers and public utility companies. The material is selected with those problems in mind which concern these groups in the production, merchandising, installation and servicing of electric refrigeration to the public.

The editorial aims of the paper have been stated in previous issues as follows:

(1) To encourage the development of the art.
(2) To promote ethical practices in the business.
(3) To foster friendly relations throughout the industry.
(4) To provide a clearing house for new ideas and methods.
(5) To broadcast the technical, commercial and personal news of the field.

Second, when anything is published in the New York Times it ceases to be a secret. A large section of the public has been informed. Under such circumstances, we believe the trade is entitled to have the same information.

Third, in the official report of the accident referred to, it is pointed out that while the installation was made by a "competent plumber," he had no prior experience in the installation and testing of electric refrigerators. We believe, therefore, that if there is a possibility of accident in any step of the installation or testing of equipment of any make, the industry is entitled to full information in order that proper instructions may be given to employees and all necessary precautions taken.

The electric refrigeration industry is confronted with many problems. Patents represent a problem to the industry, *also a problem to this paper,* as was pointed out in a previous editorial. It is a difficult subject to handle but we know, from the many letters received recently, that the industry needs and wants information on this important subject. We cannot ignore this situation just because it is difficult, and have no intention of doing so.

Similarly, accidents represent a problem to the paper, as well as to the industry. Our natural preference is for the good news. But this is a service paper. It is not a propaganda sheet. The problems of the industry are our problems. We aim to live and grow with the industry—a part of it.

We did not like to see that item in the paper, Mr. Gilmer. We did not like to see it in the daily newspapers. It was reprinted in ELECTRIC REFRIGERATION NEWS with the hope it might help the industry in guarding against another accident and more "undesirable publicity" in the newspapers.

An Invitation

Readers are cordially invited to send in local news regarding sales methods, campaigns, demonstrations, displays, etc., which you have found effective. This paper is for you—to help you increase sales and build business on a sound and profitable basis.

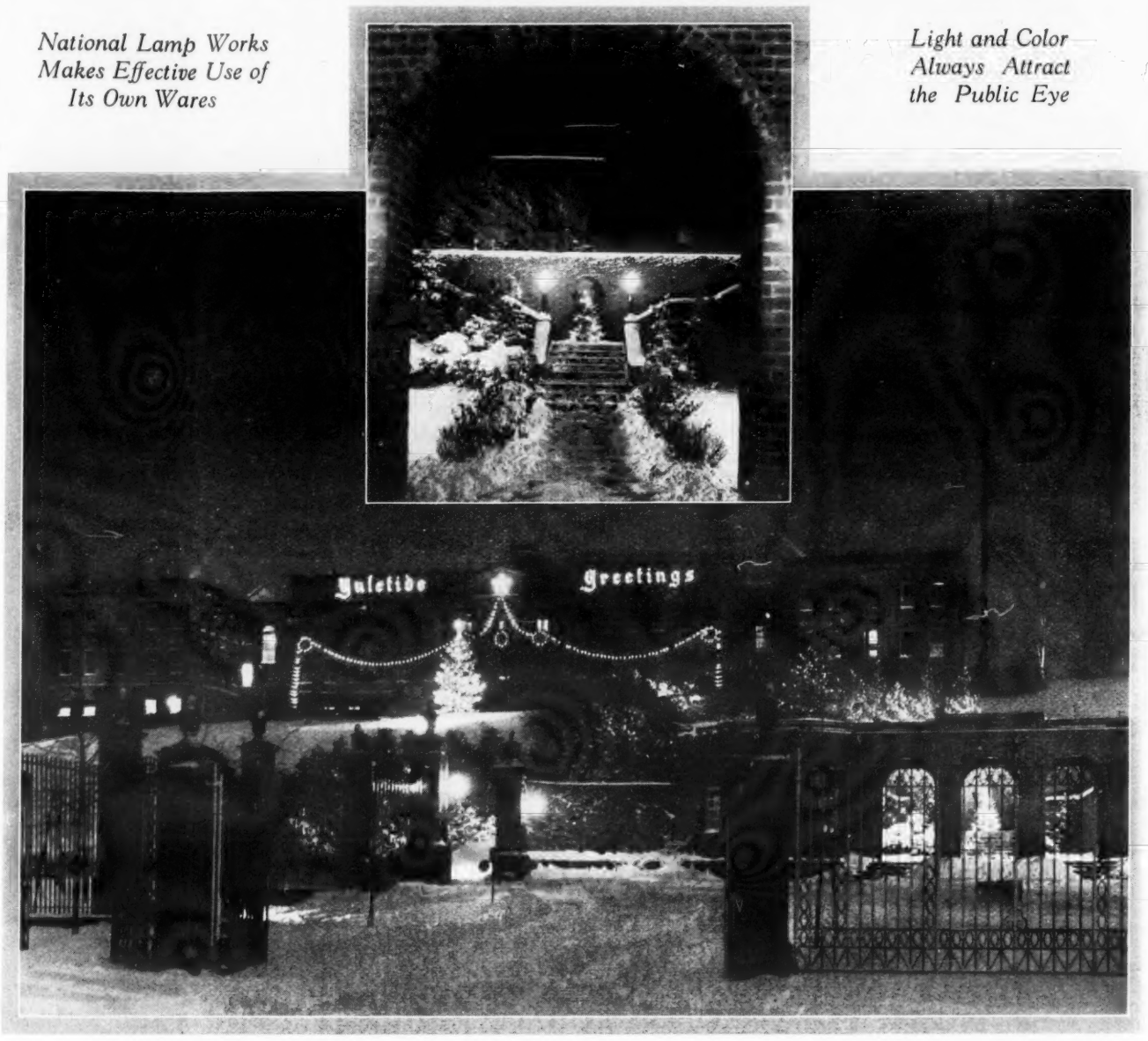
Please feel free to exchange your views and ideas with others in the field.

How the Lamp Makers Decorate with Light

Beautiful Christmas Display at Nela Park, Cleveland

National Lamp Works Makes Effective Use of Its Own Wares

Light and Color Always Attract the Public Eye



FROM OTHER PUBLICATIONS

Articles on Electric Refrigeration and Related Subjects

"Domestic Refrigeration in Chattanooga—The Tennessee Power Company, after thoroughly investigating business, has organized effective sales and servicing forces—rates, resale prices, payments, advertising mediums and prospects among subjects discussed." By H. M. Camp, lighting sales manager, Tennessee Electric Power Company, Chattanooga, Tenn.

The Chattanooga central station in 1921, adopted a combined lighting, cooking and refrigerating rate, which has been successful ever since. At first sales were made to wealthy people and 75 per cent were on cash basis. More sales were made each year on time payment basis, until in the present year, 90 per cent of installation have been on time. Time-payment plans range from 12 to 24 months. The latter plan is most popular.

Mr. Camp says, in part: "Mechanical refrigeration is costing the electric service company too much money. Too much time and attention are being devoted to the development of a great number of designs and sizes and not enough thought to the perfecting of one design and size meeting the requirements of the average person. Although there is some demand for all sizes and kinds of refrigerators, the demand for any other than three sizes (5 cu. ft., 7 cu. ft. and 9 cu. ft.) is really negligible. These types and sizes are found in practically all of the standard manufacturer's lines.

"When employing a young lady in the salesroom who is making home demonstrations of electric ranges or any other class of equipment, it is a good idea to train her how to get the best results in making the frozen dainties in the electric refrigerator. Too often this opportunity to keep customers sold on their purchases is overlooked.

"In the program this year the entire territory served by the company has been divided into districts, with one salesman devoting his whole time to this district and getting the benefit of all the business derived from the district to which he is assigned. In doing this the company took into account the number of electric refrigerators in service in each district, in the belief that where electric refrigerators had been sold in the past constitutes a fairly good index as to where they should be placed in the immediate future."—Electrical Record, December 11, 1926.

"Manufacturers of Small Motors Should Look to Their Product—Experience and long association with fractional horsepower, single-phase motors have led the industry to regard them as reliable and applicable to all sorts of service, especially on domestic and commercial appliances. With the growing popularity of electric refrigeration, however, has come rather severe criticism from both the user and the supply company on the behavior of these erstwhile dependable machines. It would appear that many of the motors were built to meet price competition rather than to give good performance. The user finds them noisy and unreliable in operation; the supply company finds them lacking in power factor and efficiency, not to mention their effect on the house-lighting service.

"Now, not all of the defects of electric refrigeration are attributable to the motor. The power companies themselves are not without fault and should look after the voltage of residential lines. But when an unbiased test shows that three-quarters of the split-phase motors and 67 per cent of the repulsion motors examined failed to come up to the requirements of the Electric Power Club itself, it is time attention was directed to the matter. It does not speak well for manufacturers of single-phase motors when 44 per cent of split-phase and 33 per cent of repulsion motors fail badly, and when there is a 100 per cent difference in weight in ¼-hp. motors. Undoubtedly changed conditions and new applications make greater demands on motors formerly used primarily in intermittent service; but as the use of fractional-horsepower motors is increasing by leaps and bounds, the manufacturers ought to take pride in turning out so reliable a product that complaints and failures of the appliance will be due to other than electrical causes."—*Electrical World* editorial, Oct. 31, 1926.

"Electric Refrigeration Follows Upward Trend—Electric refrigerator sales seem likely to be about four times as large this year as in 1925, but the advance made in the industry has attracted many new interests to the field, and extensive competition is cutting the profits, according to a report from New York City.

"However, there is still a big field for mechanical refrigeration, experts say. The 1926 sales are now forecast at 356,000 units.

"The electric refrigeration industry is getting on a sound mass production basis, but large sums are still being spent for experimental purposes and in organizing sales forces. On the other hand, prices have been reduced 10 to 20 per cent under those of a year ago. Production facilities of the four larger concerns are being increased, and in future this will allow further cutting of costs. Refrigeration experts assert that an immediate market exists for 1,000,000 electric refrigerators at present prices, and that a market for 5,000,000 will be developed within five years.

"The electric refrigerators undoubtedly have had a strong effect on the current consumed in the United States this year. The total used is running approximately 12 per cent higher than a year ago. This means that consumption for the year will total 70 billion kilowatt hours, the largest amount ever recorded. It also means that refrigeration also has had an indirect bearing on the coal, oil, building material and heavy electrical machinery industries, and on the non-ferrous metals."—Weekly Business Review, *Detroit News,* Dec. 11, 1926.

"Electric Refrigerators Save Money—But Can You Prove That Fact?—Sales resistance is usually based on price, but the salesman who can reverse the argument has a decided advantage in selling electric refrigeration."—By J. Blair Easter, sales manager, Keystone Refrigerating Corporation, Pittsburgh, Pa.

Mr. Easter proves his point by comparative figures, computing the net profit in favor of the electric refrigerator after the first year at $313.25 or the interest on $5,220. On such a basis, he says, only the wealthy can afford to be without them.

"The dealer selling electric refrigerators," Mr. Easter states, "must be prepared to answer the usual objection of cost, and he must do this specifically and conclusively."—*Electrical Record,* Dec., 1926.

"Electric Refrigeration Abuses—Advice to manufacturers who mislead customers by their advertising."—At a recent meeting of the Great Lakes Division of the National Electric Light Association, E. W. Lloyd, vice-president in charge of sales of electric light and power of the Commonwealth Edison Co., Chicago, discussing the harmful effects of production and advertising of cheap refrigerators, said in part:

"We are passing through a critical stage in the development and sale of the domestic refrigeration machine. We must see to it that we maintain an absolutely neutral attitude with regard to the product of the different manufacturers; we should encourage all of them within reason." He called attention, however, to the desirability of accessible parts to reduce service costs. "The domestic refrigerating machine ten years from now will be no more like the machine of today than the automobile of ten years ago is like that of today. The manufacturers should see to it that they have enough margin of profit of the development of new ideas and methods each year.

"I think it is a very decided mistake to sell cheap refrigerating machines and to advertise a very low-priced product, encouraging the public to believe that they will be able to get an electrically operated machine for practically the same price they have been accustomed to pay for a good icebox. This can never be accomplished, unless someone discovers a principle of refrigeration foreign to what we are now familiar with, even in the most simple forms."—*The Advertising Weekly,* Dec. 4, 1926.

Wants to Introduce Electric Refrigeration in South American City

Peter Vandeyar, an electric contractor-dealer of Cartegena, Republic de Colombia, South America (Apartado de Correo 120) has written to ELECTRIC REFRIGERATION NEWS as follows:

"It is with great pleasure I have to acknowledge receipt of sample copy of Vol. 1, No. 1 of the ELECTRIC REFRIGERATION NEWS which you were so kind to send me at the request of The Society for Electrical Development to which I have the honor to be a member.

"I return herewith the form duly filled in, and I am looking forward with interest to the subsequent copies which you intend sending me. I would, however, like to subscribe to your paper, and shall appreciate it very much if you will enter my name for one year's subscription, the value of which I will remit on receipt of your advice.

"I might mention for your information that I am an electrical contractor-dealer, and it is my intention to introduce in this city electric refrigeration, and shall be very glad to hear from first class manufacturers of this article to send me illustrated catalogues, literature giving full description, price lists and best export wholesale distributors' discounts."

Requisites of Refrigerants Told in Training Course

Fifth Lesson Explains the Individual Characteristics of the Five Substances Generally Used.

The service training course which is being published in the ELECTRIC REFRIGERATION NEWS by the courtesy of the Nizer Corporation, Detroit, has already attracted a considerable amount of favorable comment. There have been several requests for issues containing previous lessons, and readers have warmly praised the interesting information contained in these articles. The fifth lesson deals with the requisites of a satisfactory refrigerant and the characteristics of the better-known refrigerants are individually described.

LESSON 5

The Refrigerant

Copyright 1926, by Nizer Corporation

Requirements of a Refrigerant

From our previous lessons we have learned that refrigeration is usually produced by the evaporation of a liquid. The liquid used for this purpose is termed the refrigerant, and it is with it that we shall deal in this lesson. We shall study first what the requisites of a satisfactory refrigerant are and shall then learn the characteristics of some of the more commonly used ones.

Since refrigeration is produced by the evaporation of a liquid, the first requisite of the refrigerant is that it shall be volatile, that is, capable of evaporation. It should also have a sufficiently high latent heat of evaporation so that it is not necessary to evaporate too large an amount of it to produce the quantity of refrigeration that is desired.

Considering only these requisites, there are many substances which might be used as refrigerants. Water, for example, possesses these two properties and was at one time used in the production of refrigeration, but, as we study the other requisites of the satisfactory refrigerant, we shall understand why its use was not continued.

Refrigerants in Common Use

In the early stage of mechanical refrigeration, quite a large number of different substances were used as refrigerants, but as time went on the majority of these were given up and practically all of the refrigeration of the last ten years has been effected through the use of no more than five refrigerants. Of these five, Ammonia is by far the most common and is used in nearly all of the large manually controlled refrigeration systems.

Since these systems produce the great bulk of our refrigeration, it is safe to say that over 90% of mechanical refrigeration is today produced by the use of Ammonia. The four other substances referred to are Sulphur Dioxide, Carbon Dioxide, Methyl Chloride, and Ethyl Chloride. These last four have their greatest use in the field of small unit refrigeration.

One of the results of the recent development of small unit refrigeration has been the stimulation of research in the field of suitable refrigerants and, although the five substances just mentioned still dominate the field, it is entirely possible that the coming years will find us using others in addition to them or, perhaps, in place of them.

Evaporating Pressure

The ability of a liquid to evaporate is dependent upon its physical characteristics. In our last lesson we learned that evaporation is produced by a reduction of pressure and that condensation results from an increase of pressure. To be suitable as a refrigerant, the substance should have physical characteristics of such a nature that it does not require an unusually low pressure to make it evaporate nor a dangerously high pressure to make it condense. By way of example, let us take the case of a refrigerating system built to operate through the evaporation of water and used to produce refrigeration at 40° F. It is a known fact that water will evaporate and produce refrigeration at this temperature, but in order to make it do so, it is necessary to create nearly a perfect vacuum in the space in which the evaporation is taking place. The fact that it is so difficult to create and maintain so high a vacuum is in itself enough to make water unsatisfactory as a refrigerant. There are several other refrigerants the use of which requires maintaining a very low pressure in the evaporating chamber, and, as a general rule, this is something to be guarded against.

In nearly every type of refrigerating unit there is a moving connection between the atmosphere and the low pressure side. This connection is usually in the form of a shaft, either sliding or revolving in a stuffing box. If the gas pressure on the inside of the machine is less than the pressure of the atmosphere on the outside of it, there is always a tendency for air to leak through the stuffing box and enter the system. Besides reducing the efficiency of the system, this, in the case of some refrigerants, has a decidedly harmful effect on the mechanism. Experience has shown that it is easier to prevent the refrigerant from leaking out of the machine than it is to prevent air from leaking in, consequently, refrigerating engineers usually prefer an evaporating pressure that is somewhat above zero to one that is any below it. The ideal evaporating pressure is, of course, one of just exactly zero, for then there is no tendency for a leak in either direction through the stuffing box.

Condensing Pressure

Not only is the question of pressure important in the low pressure side of the refrigerating system, but it must also be considered from the view of the high pressure side. Especially in the household refrigerating units is it important not to use a refrigerant that requires a dangerously high pressure for its condensation. A striking example of such a refrigerant is to be found in Carbon Dioxide, for this gas requires a pressure of almost 1,000 pounds per square inch to liquefy it at the temperature ordinarily found in the condenser of the small automatic machine.

Additional Requirements of a Desirable Refrigerant

In addition to its operating pressure, there are several other requirements which must be possessed by the desirable refrigerant. Among the first of these is its safety and this item includes explosiveness, inflammability, and the effect on human health. The ideal refrigerant should not be explosive, neither should it burn nor support combustion, and if possible it should be harmless in its effect on the person, so that in the case of a leak in the home or place of business, the occupant will suffer no harm. If the refrigerant cannot be made non-poisonous it should at least be of so pronounced and distinguishable an odor, that it cannot be breathed unknowingly. In addition to possessing a distinguishing odor, which will call attention to a leak, the refrigerant should be of such a nature as to provide for a visible leak test, for regardless of how carefully a system may be constructed, there is always the possibility of a leak, with its attendant loss of gas, and in the case where the leak is small, the odor alone is usually not sufficient to locate its source.

Sulphur Dioxide gives a very good example of a visible leak test, for if ammonia be brought into the vicinity of even the most minute leak, the escaping gas will be turned into a dense white vapor, which immediately enables the observer to locate the place of the leak. Certain refrigerants provide no such means of leak detection and it is not uncommon for a system using such a refrigerant to lose its entire charge, without discovery of the source of the leak being made.

Cost and Stability

The cost of a refrigerant, together with its length of life, has considerable bearing on the desirability of using it. Most refrigerants are the chemical combination of two or more elements, and the effect of constant evaporation and condensation is, in some cases, to break down the bond between the elements of which the refrigerant is composed and thus to destroy it. To make constant renewal of it unnecessary, the refrigerant should be stable and not easily broken into its component parts.

Necessity for a High Critical Temperature

In our last lesson we studied critical temperature and learned that the critical temperature of a gas is that temperature above which the addition of pressure will not serve to condense it. Obviously, if the temperature in the condenser rises above the critical temperature of the gas within it, condensation of the gas will not take place and the operation of the system will soon be stopped. To be safe, the critical temperature of the refrigerant should be considerably higher than the highest temperature ever encountered in the condenser.

Lubrication Problems

Every system composed of moving parts requires that its parts be properly lubricated if they are to serve their purpose long and efficiently. The refrigerant then should be of such a nature that it does not interfere with proper lubrication. The two most common difficulties in the way of lubrication are the attacking of the oil by the refrigerant, so that its lubricating qualities are destroyed and the combining of the oil with the refrigerant. The latter affects the refrigeration more than it does the lubrication, but it must, none the less, be guarded against. The satisfactory refrigerant has little or no chemical effect on the lubricant and is of a different density from it, preferably greater, so that the two mediums are kept separate within the system.

Effect of Refrigerant on Metals

The last qualification that we shall consider in this lesson, has to do with the effect of the refrigerant on the metal of which the machine is composed. The refrigerant should not react chemically with the materials of which it is desirable to construct the machine. The destructive action of the refrigerant on the metal is termed corrosion, and an example of it is to be found in the case of ammonia and copper. Although showing no effect on iron or steel, ammonia liquid corrodes copper very rapidly and for that reason copper or bronze cannot be used in an ammonia system. Due to its high heat conductivity and the ease with which it can be worked, copper is most desirable for use in the household type of refrigerating unit and as a result ammonia is rarely used in this type of machine.

NOTE: The values for boiling point, melting point, critical temperature, and latent heat as they appear here were taken from "Properties of Refrigerants" through the courtesy of its publishers, The American Society of Refrigerating Engineers.

Properties of the Common Refrigerants

Following is a list of the characteristics of the five refrigerants to which we have already referred, which the student should study in the light of the first part of the lesson.

Ammonia (NH_3)

Ammonia, as has already been stated, is the most commonly used of all refrigerants. It is a chemical compound of nitrogen and hydrogen (NH_3) and under ordinary conditions is a colorless gas. Its boiling temperature at atmospheric pressure is —28° F. and its melting point —108° F. The low boiling point makes it possible to secure refrigeration at temperatures considerably below zero, without resorting to pressures below atmospheric in the evaporator. Its latent heat at 5° F. is 565 B. T. U. per pound, so that large refrigerating effects are possible, with the use of relatively small sized machinery. Condensers for ammonia machines are almost always of the water-cooled type. Under ordinary operating conditions, the condenser pressure will vary from 150 to 200 pounds per square inch.

Ammonia is somewhat inflammable and with the proper mixture of air will form an explosive mixture. Accidents from this source, however, are rare. Ammonia gas the respiratory system is so violent that is not classed as poisonous, but its effect on only very small quantities of it can be breathed. About .35 volumes per 1000 volumes of air is the strongest concentration bearable for any length of time. Because of its pronounced and distinguishable odor and also the white smoke that it forms in the presence of sulphur vapor, ammonia leaks may be quickly and easily detected.

Ammonia, although attacking copper and bronze, does not corrode iron or steel and it presents no special problems in connection with lubrication, other than those attendant upon the extreme temperatures encountered in the system. Ammonia gas is extremely soluble in water.

(*Continued on page 6*)

San Francisco Department Store Operates "Advisory Electric Kitchen"

One of the features of the "advisory electric kitchen" maintained by the household equipment department of The Emporium, a department store in San Francisco, is Servel electric refrigerator. The kitchen is in charge of a food specialist who advises visitors on all subjects relating to the preparation of food and the use of electric equipment. When the kitchen was opened last March, full page newspaper advertisements were used to announce the opening.

Believes "News" Will Help Salesmen

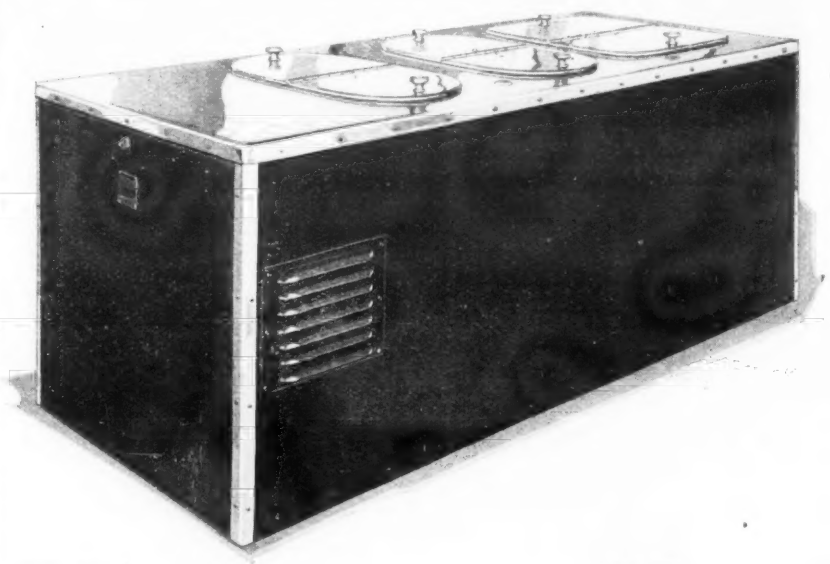
Robert P. Payne, manager appliance department, Northwestern Electric Equipment Co., St. Paul, Minn., writes:

"I have been using mechanical refrigeration in my home for the past four years and three months with such wonderful success that I really cannot understand why so many homes have not been equipped, but I believe that through your publication many salesmen will become better prepared to close a great many more sales, as they may obtain the views of other organizations and the solution of problems which, no doubt, will be reviewed in your paper."

S. E. D. Man Wins Prize Refrigerator

George E. Jacquet, assistant secretary of The Society for Electrical Development, was the winner of the Servel electric refrigerator offered as a prize by the Servel Corporation at the Electrical and Industrial Exposition held recently in New York.

Printed leaflets were distributed at the model home display on the first floor, suggesting that the recipients visit the Servel exhibit on the third floor, and offering as an inducement a chance on an electric refrigerator. This suggestion attracted several thousand visitors to the upstairs booth. The drawing was made by Arthur Williams, president of the exposition company and vice-president in charge of public relations of the New York Edison Company.



Ask about the new line of 2-, 3- and 4-hole Nizers for small stores. Economical, ample capacity, efficient. The combination cabinet, with a compartment for bulk milk or bottled goods, will interest you. The most progressive step in cabinet engineering since Nizer pioneered the electric ice cream cabinet.

Your small stops
can now be made very profitable!

Nizer Engineering Genius once more blazes the trail and once more enables the alert manufacturer to further extend the sale of electrically kept ice cream.

Model E, Air-Cooled, in 2-hole, 3-hole, 4-hole, and 2- and 4-hole "Ice Cream and Bottle Combination" cabinets introduced at the recent Dairy Industries Convention in Detroit, was enthusiastically received. Thirty car loads were sold during convention week!

Designed primarily to make profitable the small stops for the ice cream manufacturer, Model E incorporates important refinements—notably in extreme quietness of operation and enhanced efficiency. 215 lbs. ice melting capacity, with this new ⅛ h. p. motor! Unprecedented!

But true to the basic ideals upon which Nizer was originally conceived, designed and built, Model E refinements can for the most part be adapted to all existing models at small cost. Thus does the engineering foundation upon which all Nizer cabinets rest protect the investment of each Nizer customer.

Write the Nizer branch nearest you for full information.

NIZER

REG. U. S. PATENT OFFICE

THE PIONEER ELECTRIC ICE CREAM CABINET

Sold only to or through ice cream manufacturers by Nizer Corporation, Division of Electric Refrigeration Corporation, and in Canada by Kelvinator of Canada, Ltd., London, Ontario.

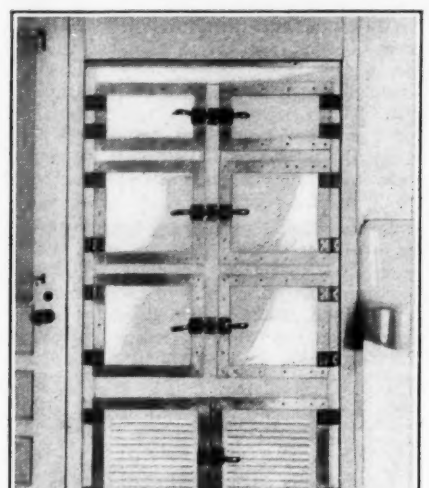
NIZER SALES AND SERVICE

7424 Mackie St., Detroit
816 Sharples Bldg., Chicago
431 Spring St., Atlanta, Ga.
620 S. Delaware Ave., Philadelphia
1 West Forty-seventh St., New York
4003 Wentworth Ave., Minneapolis, Minn.
1911 Washington Ave., St. Louis
411 Park Square Bldg., Boston, Mass.
1916 Gorman Avenue, Waco, Texas
301 Westinghouse Bldg., Los Angeles, Cal.
701 Pacific Bldg., San Francisco

Interesting Apartment Installations

At right—Servel electric refrigerators built in flush with the kitchen wall.

Below — Servel electric refrigerator in apartment kitchenette. Note the false floor with tile baseboard which sets up the refrigerator to a more convenient level.



REQUISITES OF REFRIGERANTS

Explained in Nizer Training Course

(*Continued from page 5*)

Sulphur Dioxide (SO_2).

Just as ammonia dominates the field of refrigerants for large size plants, so is sulphur dioxide more commonly used than any other in the case of the small automatic unit. Sulphur dioxide was first produced in 1775 and in addition to its use as a refrigerant, it has considerable use in the industries for such purposes as refining sugar, bleaching wool, food preservation, and fumigation. It is usually produced by the burning of sulphur in the presence of oxygen. Its chemical formula is SO_2. At atmospheric pressure, and all temperatures above 14° F. it is a colorless gas of very pronounced odor. Its boiling point at atmospheric pressure is 14° F. and melting point —103.4° F. Its critical temperature is about 315° F. As a result of its boiling temperature being at 14 degrees, it is necessary to operate at pressure somewhat below atmospheric, when temperatures below this figure are required. Little difficulty, however, has been experienced as a result of this, and other advantages tend to offset it. The comparatively high boiling point, for instance, makes condensation of the gas easy and it is rarely necessary to exceed 100 pounds per square inch in the condenser, and water-cooled machines with as low as thirty pounds pressure in the high side are not uncommon in winter operation. The latent heat of sulphur dioxide at 5° F. is 175.6 B. T. U. per pound. This is not quite one-third of the value for ammonia, under the same conditions, and although it makes necessary a circulation of almost three times the amount of sulphur dioxide as of ammonia, for the same amount of refrigeration, it is not a disadvantage in the case of the small capacity machine, for it permits the construction of the parts of a sufficiently large size to be practical and efficient.

The chemical bond between the elements of the sulphur dioxide is particularly strong so that deterioration of the refrigerant does not take place as a result of the continued repetition of evaporation and condensation. It is therefore unnecessary to renew the refrigerant within the system, except in the case of actual loss.

Sulphur dioxide is non-explosive and non-inflammable, and, although of an extremely irritating odor, is comparatively non-toxic. As little as three parts by volume, in one million parts of air, are enough to produce a noticeable odor, and thus call attention to the presence of the gas. In addition to its odor, SO_2 provides for a visible test for leaks, as explained earlier in the lesson, and with this method the most minute leak can be detected.

The lubricating problem in connection with SO_2 is perhaps easier than with any other refrigerant, for sulphur dioxide itself possesses certain lubricating properties. It does not react chemically with the proper kind of oil, and is practically 50% heavier than the oil. This latter permits of the separation of the lubricant from the refrigerant, which is essential to the proper kind of operation. Most oils are somewhat soluble in SO_2, but the usual extent of this solubility is more of an aid than otherwise, for it permits of a desirable circulation of the lubricant with the refrigerant.

The only characteristic of Sulphur Dioxide that is not desirable from the standpoint of its use as a refrigerant is its action in the presence of water. SO_2 combines with water to form Sulphurous Acid, which attacks the metals of the system. There is no danger of this, however, when water is not present, and modern methods of manufacture have entirely overcome the corrosion hazard.

Methyl Chloride (CH_3CL)

Methyl Chloride is classed as a non-corrosive and non-poisonous refrigerant, although the breathing of sufficiently large quantities of it will result in the suspension of the respiratory functions and subsequent death. In smaller concentrations, it has the effect of a mild anesthetic and in odor is similar to chloroform. Its boiling point at atmospheric pressure is —11.36° F. and melting point —132.7° F. Its critical temperature is 289.6° F. The latent heat of evaporation at 5° F. is 178.5 B. T. U. per pound. Condenser pressures in the vicinity of 100 pounds per square inch are ordinary for the methyl chloride machine, although, with the use of water cooling in the condenser, these may be considerably reduced. Methyl Chloride is both combustible and explosive, although not to such an extent as to make its use dangerous.

Methyl Chloride has been used as a refrigerant to some extent by the French Navy, and the British Expeditionary Forces in the Soudan were equipped with ice machines which used it. A number of small unit machines now on the market are using Methyl Chloride with apparently good results.

The two greatest difficulties presented by the use of Methyl Chloride are its effect on the lubricating oil in the machine, and the difficulty with which leaks in the system are detected. This refrigerant dissolves most of the common lubricants, and renders them ineffective, and as yet no satisfactory method has been developed whereby small leaks may be accurately located.

Ethyl Chloride (C_2H_5CL)

Ethyl Chloride is similar in many respects to Methyl Chloride, being a member of the same chemical family. The outstanding difference is found in the low pressure at which it evaporates. At atmospheric pressure, the boiling temperature of Ethyl Chloride is 55.6° F. Its melting point is —217.7° F. and critical temperature 361° F. From the value of the boiling temperature it can be seen that for refrigeration at all temperatures below 55.6° F. it is necessary to operate with an evaporator pressure below that of the atmosphere. This disadvantage is somewhat counterbalanced by the correspondingly low pressure encountered in the condenser. Pressures of the condenser of from 10 to 20 pounds per square inch are common, and as a result of the low pressure operation, Ethyl Chloride is more suited for use in the rotary compressor than in the more common reciprocating type.

The use of Ethyl Chloride presents the same difficulty of lubrication and leak detection as does Methyl Chloride, and the substance itself possesses similar explosive and combustible characteristics to the latter. Its odor is similar to that of ether and its effect of a like nature, but extremely more mild. Its latent heat of evaporation at 5° F. is 177 B. T. U. per pound.

Carbon Dioxide (CO_2)

Carbon Dioxide differs considerably in its characteristics from any of the four refrigerants already discussed. This difference is especially marked in the matter of the pressures encountered within the machine, the operating pressures in the CO_2 machine being many times higher than those encountered in the others. At ordinary temperatures and pressure CO_2 is a colorless and odorless gas considerably heavier than air. It is non-explosive, non-inflammable, and non-toxic. The boiling point of Carbon Dioxide is so extremely low that even at 5° F. a pressure of over 300 pounds per square inch is required to prevent its evaporation, while with a temperature of 80° F. in the condenser a pressure of almost 1000 pounds per square inch is required to liquefy it. Its critical temperature is 87.8° F., so that it can be used only where relatively cold water is available for condenser cooling, and cannot be used at all with the air-cooled type of condenser.

As a result of the high operating pressures, the cylinder of the CO_2 machine is quite small for relatively large refrigerating capacity, and the machine is therefore particularly adapted to use on shipboard, where space is at a premium. The latent heat of evaporation of Carbon Dioxide at 5° F. is 116 B. T. U. per pound.

Electric Refrigeration Recipes

BY SELMA E. DAHLGREN

Cranberry Freeze

That good old fashioned dish—cranberry sauce—takes on new interest when prepared this delightful, easy way. Boil the cranberries for ten minutes, two cups of water to each quart of berries. After forcing through a sieve add two cups sugar and the juice of two lemons and one orange. Place in freezing chamber of electric refrigerator and let chill three hours.

Frozen Asparagus-Tip Salad

A special mayonnaise and cheese dressing gives this dish a different and tastier flavor than is usually found in vegetable salads. Work one-quarter pound American cheese with a fork until smooth and even in texture. Blend thoroughly with four tablespoons mayonnaise. Beat one-half cup of heavy cream with wire spoon or fork until stiff, and stir in two tablespoons lemon juice and one-fourth teaspoon salt. Combine with cheese and mayonnaise dressing. Add one quart of canned asparagus tips. The can should be opened at least two hours before using. Place salad in moulds in freezing compartment of electric refrigerator. Let stand for four hours. Serve on chilled lettuce.

Lobster Mousse

Flake one cup boiled lobster. Add salt, paprika, a few capers, two teaspoons lemon juice and two hard boiled eggs grated fine. Dissolve one tablespoon gelatin in hot water. Mix with one cup boiled salad dressing, and blend with the lobster. Put in molds and let stand in freezing compartment until firm (about three hours), then remove to lower part of refrigerator. Serve on lettuce leaves, garnish with slices of lemon.

Snowball Parfait

Boil one cup sugar with one-half cup water until thick syrup has formed. Beat whites of three eggs and when stiff combine with syrup by pouring latter slowly into beaten egg whites. Whisk mixture briskly until cool. Add one teaspoon vanilla extract. Fold mixture into one pint of rich cream whipped thoroughly. Pour into moulds and place in freezing compartment of electric refrigerator. Let stand four hours. When ready to serve add Maraschino cherries or gum drops in assorted colors to each portion.

Oriental Punch

Boil one cupful of sugar with one cupful of water for six minutes. Add six cloves, an inch stick of cinnamon, dessert spoonful of chopped ginger root, and let stand till cold. Add juice of three oranges, two lemons, a drop of peppermint, two sprigs of mint. Let stand till needed. Strain before serving. Combine with equal quantities of iced tea if larger serving is needed, or with ginger ale and charged water Garnish with mint leaves.

Fruit Punch

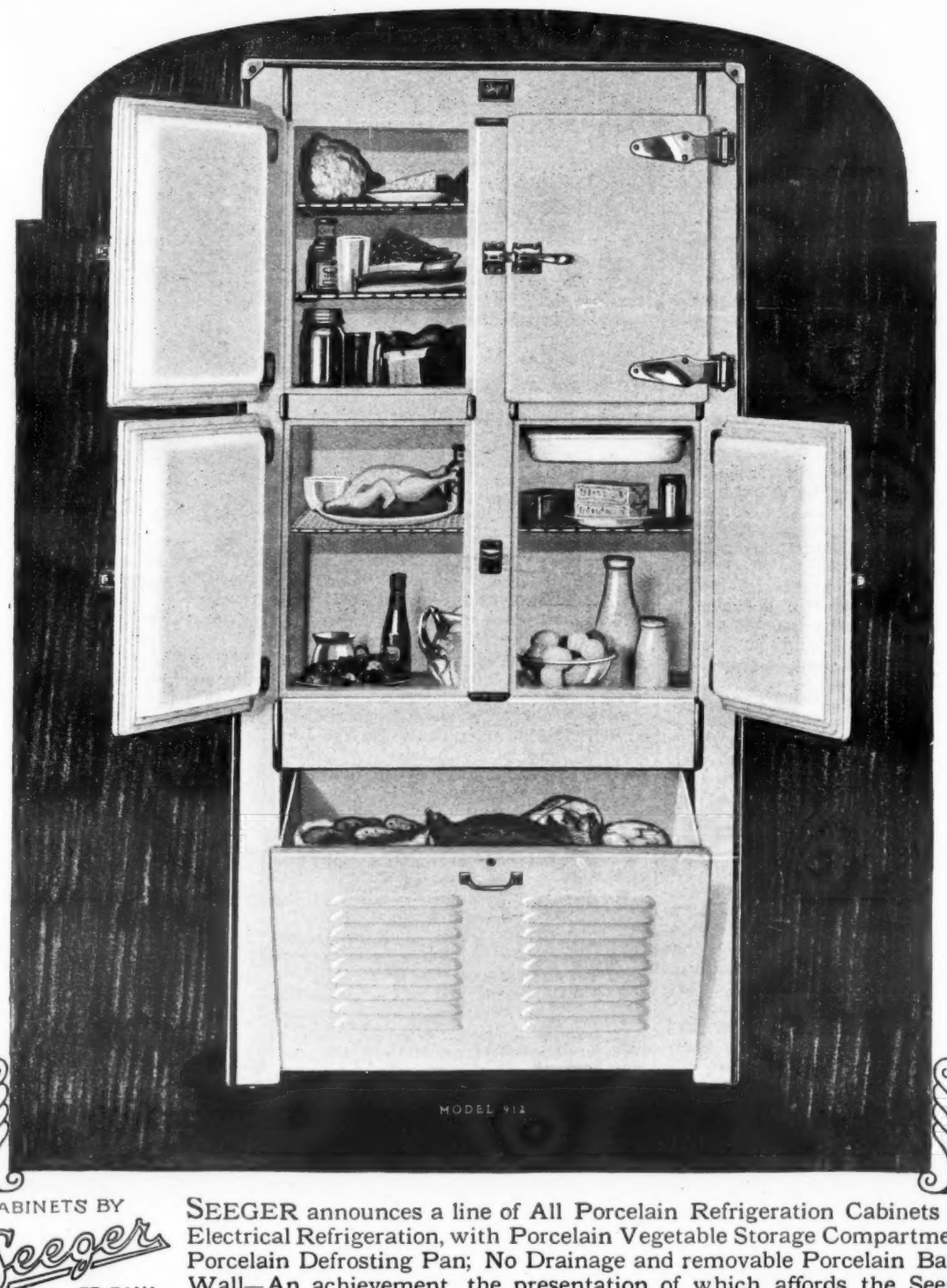
Combine one pint bottle of grape juice, three tablespoonfuls of lemon juice, one-third cupful of orange juice, one cupful of fresh pineapple pulp with juice, rind of lemon and orange, one-eighth teaspoonful of salt, and a few gratings of nutmeg. Let ripen with eight tablespoonfuls of syrup in lower compartment. Add soda water and serve with ice cubes in tall glasses garnished with mint. Whipped cream may also be used.

Mint Julep

Extract juice from five lemons, and grate the rind of one. Add a handful of mint leaves, one cupful of syrup and three pint bottles of ginger ale. Serve in small glasses with ice cubes.

Lemon Float

Ices and sherbets when added to cold drinks are a pleasant surprise. Let ripen in the coldest compartment one pint of pineapple juice, one pint of time to serve, place a cube of sherbet or mousse in each tall glass, add one quart of charged water to the fruit syrup and fill up the glasses.



CABINETS BY Seeger ST PAUL

SEEGER announces a line of All Porcelain Refrigeration Cabinets for Electrical Refrigeration, with Porcelain Vegetable Storage Compartment; Porcelain Defrosting Pan; No Drainage and removable Porcelain Baffle Wall—An achievement, the presentation of which affords the Seeger Refrigerator Company a great pride and satisfaction.

The representatives of Electrical Refrigeration will be pleased to show and demonstrate the new Cabinets by Seeger.

Cabinets by Seeger for use with ice will continue to be shown by usual representatives.

SEEGER REFRIGERATOR COMPANY

SAINT PAUL — NEW YORK — BOSTON — CHICAGO — LOS ANGELES — ATLANTA

STANDARD OF THE AMERICAN HOME

This is a reproduction of a page ad in *The Saturday Evening Post*, January 8th, 1927

These Cabinets are built to accommodate any standard Electric Refrigeration unit without change to the Cabinet.

"WHY I LIKE THE ELECTRIC REFRIGERATOR"

A series of Interviews the Society for Electrical Development has had with people who speak from their own experience.

Food Doesn't Spoil if Housewife Stays Away Awhile

By SHIRLEY ELEANOR DANE

"Of all the added joys that my electric refrigerator has brought to me, I guess I consider its food-keeping qualities the most important," declared a thoughtful matron in a thriving little town in southern Wisconsin.

"In winter I always plan to have an easy lunch for myself and the children by heating something left from the preceding day. Sometimes I make a cream soup from vegetables, or cook the vegetables with the meat gravy. But summer time has always meant much work for me, as far as food is concerned, because I had to plan to use up everything each day.

No Week-End Worries

"If we were invited out for the day or took a trip over the week-end, or were away from home for a day or so, I never knew what to expect from the weather, of course. If I left anything at all perishable I was always sorry that I hadn't given it to my neighbors rather than take a chance on finding it spoiled when we returned.

Free to Drive Often

"Last summer was mostly fine weather, but that meant we drove more instead of staying inside to keep cool. I believe in keeping young with my children, and I like to be out with them in the summer. But one should not have to let food be a bigger problem than laundry work or cleaning, so I got busy and decided that if electric refrigeration were past the fad or experimental stage it was the next necessity for us.

"First, we thought we would sell our box, it was so large, but a friend of my husband, who is a refrigerator engineer (he installs systems in hotels, storage plants and theatres), saw our box and said it was so sound and well built that it would pay us to use it—simply have the cooling unit put where we used to store ice.

New Cooling Unit in Old Box

"That was what we did. It was some little time before it ran smoothly, so I'm glad we chose March for the installation, as occasional off days for having the mechanic adjust the machinery didn't interfere with my use of the refrigerator.

"I'm very glad we made the change. As I said, I don't like to let food get the upper hand of me, and that was the case in our home the first fifteen years we were married. Now I expect that some one will tell me that I'm looking years younger, or that my disposition has improved some amazing per cent, or something equally flattering. It has happened to me before when I've found the solution to some household problem, and this food business is the biggest one I've tackled yet, so I deserve a compliment.

"Yes, that's the way I look at it. Men call it in business 'being on top of their job.' That's where I am just now, and I'm 100 per cent happy."

ELECTRICAL COOKERY

Refrigerator Novelties

By Stella Elizabeth Deland

Refrigerator novelties are most interesting for suppers, teas, and guest luncheons on warm days. I always keep a choice number of recipes for this type of food in the kitchen. I am giving several of my pet recipes which serve this purpose admirably. They are simple and inexpensive to prepare.

Salmon a la Chaud-froid

Take two cups of flaked fresh-cooked or canned salmon and put in a saucepan with two tablespoonfuls of butter, one teaspoonful of anchovy paste, one teaspoonful of Worcestershire sauce, a few drops of onion juice, salt, pepper and paprika to taste. Heat slowly and stir over "low" heat on the heating top of your electric range, or in the deep pan of your electric grill. When everything is melted and warm, remove from heat and add six tablespoonfuls of dissolved gelatine. Let cool, shape the mixture in half-eggs with a large tablespoon and place in the electric refrigerator to chill. When cold chaud-froid them and glaze with white aspic. Serve on a lettuce leaf or a bed of green vegetables and garnish with "roses" cut from radishes and some finely chopped parsley.

Sauce Chaud-froid

Over "low" heat place one-half cupful of milk and to this add, stirring the while, one tablespoonful of flour that has been dissolved in one-half cupful of milk, and let boil slowly until it thickens. Then strain, stir on ice and add four tablespoonfuls of dissolved gelatine, then a little cooking sherry if you have it, and last fold in one cup of cream. This sauce is used for coating various cold dishes, and gives them a most impressive appearance.

Tuna fish, lobster, crabmeat or shrimp may be used the same way.

At Last

An ice cream cabinet—designed—developed and built from actual experience in the ice cream industry by one of America's largest venders of ice cream—the

General Necessities Corporation
of Detroit

Points of Superiority of the Absopure Ice Cream Cabinet

Powerful single-cylinder compressor; used on 2 - 3 and 4 hole cabinets.

Powerful two-cylinder compressor; used on 6 - 8 - 10 and 12 hole cabinets.

Either remote or self-contained (condensing unit attached directly to cabinet).
Air cooled or water cooled.

SIZES: 2 - 3 - 4 - 6 - 8 - 10 and 12 hole cabinets.

COMPRESSOR: Rugged and of extreme simplicity, insuring long life.

MOVING PARTS: High grade bronze—forgings—special steel.

RUNNING TIME: Capacity and efficiency insures low running time, thus increasing the life of the unit and lowering service cost.

LIDS: Molded rubber handles—Monel top — projecting rim — sanitary gasket. This insures air-tight fit over ice cream hole, assuring sanitation and protection.

COILS in brine tank around containers insure equal distribution of refrigeration. The brine being above the top of ice cream cans insures proper density at top of ice cream.

INSULATION: Cork board—three inches on sides; four inches on bottom. Cork sealed to brine tank to prevent formation of air pockets and all other joints sealed to prevent circulation of air. This construction prevents the obnoxious formation of frost and ice.

SANITARY BEAD: Preventing introduction of germ ladened waste matter into ice cream.

ABSENCE OF NOISE: The ABSOPURE is the quietest operating unit on the market due to its excellent design and careful construction—there is no valve noise.

FRAME: Heavy angle iron, electrically welded.

TOP: Made of non-rusting Monel metal.

REFRIGERANT: Methyl Chloride; safest and most efficient refrigerant known. Contents of 10 machines can be dumped on the floor without injury or even attracting the occupants of the room — non-suffocating — non-poisonous — non-explosive.

NO MOVING PARTS IN BRINE TANK: No boiler with its delicate moving parts. No moving parts in the brine tank, thereby further insuring long life. Made of highest grade pure copper with top closed; copper sleeves tinned inside; bottom covered with heavy rust-proof plate, preventing shock of falling can coming upon brine tank.

LOW SERVICE COST: Insured by very few moving parts and exceptional ease of replacement. Entire working portion of compressor can be replaced at small expenditure.

These Ice Cream Cabinets have won in every competitive test made by thirty American Ice Cream Manufacturers.

Let us send you the results of some of these tests--Here you will find the actual figures you have been looking for--not surmises and approximations.

WRITE OR WIRE US TODAY

GENERAL NECESSITIES CORPORATION
FRIGERATOR DIVISION
DETROIT, MICH.

REFRIGERATION DEALERS —The above is only one item of a complete commercial refrigeration line now being produced to help Dealers to make money the year around.

REFRIGERATION DEALERS —Have you seen the General Necessities Corporation long time franchise which gives the Dealer ample time to build up a profitable business in the industry?

Cleveland Survey Shows Big Market Based on Past Sales of Appliances

Estimate Possible Additional Sales of Electrical Appliances for Wired Homes at $84,610,125.00—Only One Percent Have Electric Refrigerators

The fact that Cleveland has the highest per capita consumption of electric current of any large city in the country is frequently cited as a proof of the benefits of cooperative activity. The Electrical League of Cleveland, with headquarters on the top of the Statler hotel, is one of the strongest in the field, has the largest annual budget, and has taken the leadership in many movements.

It was the first to establish a cooperative program to promote electric refrigeration. A fund of $15,000 was raised early in 1926. Newspaper advertising was used extensively, an exhibit was set up, lectures were arranged for groups of women at frequent intervals, and other educational activities were organized.

The following estimate of the Cleveland market for electrical appliances recently appeared in the *Cleveland Plain Dealer:*

"A recent survey shows that Cleveland homes have been provided with electrical appliances according to the following percentages:—hand irons 97 per cent, vacuum cleaners 84 per cent, toasters 68 per cent, clothes washers 52 per cent, percolators 45 per cent, fans 39 per cent, radiant heaters 34 per cent, grills 28 per cent, heating pads 21 per cent, sewing machines 21 per cent, waffle irons 21 per cent, ironing machines 3 per cent, ranges 2 per cent, electric refrigerators 1 per cent and dishwashers only a fraction of 1 per cent.

"In other words, in 100 homes there are 516 appliances out of a possible 1500, with an apparent saturation of 34.4 per cent. However, in view of the fact that the saturation for refrigerators and some of the major appliances will probably never reach more than 60 to 75 per cent, it is reasonable to assume that the Cleveland market has been developed to nearly 50 per cent of the possible saturation point.

"A conservative estimate shows the following sales possibilities: additional appliances for wired homes, $84,610,125; for replacements and additions to home lighting equipment $5,850,000; wiring for additional switches, lighting and convenience outlets $4,387,500; total, $94,847,625. Without taking into consideration industrial equipment sales we may add industrial lighting improvements in existing factories $5,000,000 and commercial lighting improvements in existing stores $4,000,000, making a total of $103,847,625.

"To impress upon electrical men the importance and advisability of raising the standards in wired buildings, no reference has been made to the comparatively few unwired old buildings or to the new buildings which will be more completely equipped.

"These enormous possibilities bear evidence that the proper demand for things electrical has not been created in the minds of the people. In other words the users of electric service have not been fully informed concerning its numerous advantages when carefully applied."

Public Libraries Want Oct. 6 Issue

Both the New York and Detroit public libraries are anxious to obtain copies of the October 6 issue of ELECTRIC REFRIGERATION NEWS, but we have been unable to complete their files because our stock is exhausted. E. H. Anderson, director of the New York Public Library, writes as follows:

"In view of the importance of completing our file we are venturing to make a suggestion. It is that a notice be inserted in one of your forthcoming issues to the effect that this number is needed in the New York public library's file, and the courtesy will be greatly appreciated if some reader, who no longer needs his copy, will send it to us. This method of obtaining missing numbers is frequently employed for us by publishers and almost invariably with successful results. We shall be glad to hear from you and shall appreciate any courtesy you may extend to us."

Michigan Inspectors Discuss Electric Refrigeration

One hundred and fifty members of the Michigan Association of Electrical Inspectors met in the auditorium of Detroit Edison Building, Detroit, Monday evening, December 20. J. C. Burton, manager appliance department of the Detroit Edison Company, addressed the group on the subject of household appliances. F. M. Cockrell, editor of ELECTRIC REFRIGERATION NEWS, outlined the development of electric refrigeration and gave an explanation of the purpose and operation of the various parts of the equipment.

SIGN IT NOW!

Increased rate after Jan. 1, 1927.

LEAP FIRST, THEN LOOK

The average person never reads an instruction book until something goes wrong, according to the head of the complaint department of a large Detroit store. "This is especially true of household machines," he said. "Most housewives will try to operate something with which they are not familiar without bothering to see what the manufacturer has to say. Then when there's an accident they read the book so they can be sure to tell us that they followed directions when they make their complaint."—*Detroit News.*

Impressed by Charts of Symptoms and Remedies

The advertising department of the Kelvinator Corporation has kindly forwarded the following letter received from the Toledo, Iowa, office of the Iowa Railway and Light Corporation. The letter is signed jointly by M. R. Thompson, salesman, and Russell Wise, service man.

"We are informed that there is a paper called 'ELECTRIC REFRIGERATION NEWS,' which is being received by some of the men in this territory, but we have not received it yet.

"We notice some very good material in this paper, such as 'Sample Chart of Symptoms and Remedies for Central Station Service Men.'

"If this is being distributed, we would like very much to be on the mailing list.

"This is all new to us out here, and all the extra dope we can get on electric refrigeration will help us a great deal."

Note to Messrs. Thompson and Wise: We regret that you were missed in the initial mailing. Sample copies will be forwarded and we will be pleased to receive your subscriptions.

Subscription Coupon

Note: This offer expires December 31, 1926.

BUSINESS NEWS PUBLISHING CO.
409 EAST JEFFERSON AVENUE
DETROIT, MICH.

DATE_____

Gentlemen:

Please enroll me as a subscriber to ELECTRIC REFRIGERATION NEWS, the Business Newspaper of the Electric Refrigeration Industry, at the special introductory rate now being offered.

United States: ☐ Three years, one dollar ☐ One year, fifty cents

Foreign Countries: ☐ One dollar per year.

I am enclosing payment in the form of

☐ Check ☐ P. O. Order ☐ Cash

Name_____

Company_____

Street Address_____

City and State_____

☐ **Note:** If it is inconvenient for you to enclose payment with this order, check this square and invoice will be mailed Do it now, while you have the blank before you. It will save the time and trouble of writing a letter, and you will be sure to get the next issue.

CLASSIFIED COLUMN

EXPERIENCED SALES EXECUTIVE DESIRES CONNECTION

An electric refrigeration man, well known in the industry, now in an important position, desires to make a new connection. He has had large-scale sales experience and is well-grounded in matters pertaining to electric refrigeration. Owing to his present responsibility, any indication that he is available might reflect upon his present company, and this he desires to avoid. If interested, simply write "interview requested" on your card and mail to Box 6, Electric Refrigeration News.

EXECUTIVES WANTED

Old established manufacturing concern ready to organize Electric Refrigeration Sales Division to market product. Six years developing and two years on the market. Give complete history in first letter. Box 5, Electric Refrigeration News.

POSITION WANTED

Service man with wide selling and servicing ability experienced in household and small commercial refrigerating machines, capable of training sales and service men, desires position with responsible firm. Address inquiries to Box 4, Care of Electric Refrigeration News.

FOR SALE

Patent cooling container for any make of electric refrigerator, from 25 to 100% more efficient than any absorber or container on the market today. For details write J. Remonte, 305 Main St., Ranger, Tex.

Not if They Have an Electric Refrigerator

When people listen to music, asserted a Kalamazoo lecturer, they usually let their minds rove and "wonder whether the water pan in the refrigerator is running over."

We Manufacture to Your Specifications
Ice Cream Cabinets and Parts
Write for Interesting Information
MOTORS METAL MFG. CO., Detroit, Mich.

Parts and Products
FOR THE
Electric Refrigeration Industry

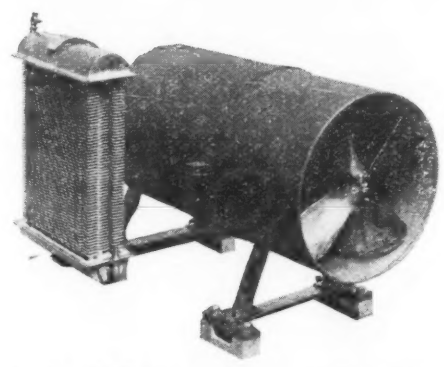
Brine Tanks
Liquid Receivers—Forged Fittings
Perforated Sheet Metal

Air Cooled Condensers
Low Temperature Oils — Motor Pulley Fans
Forged Valves — Automatic Controls

Metal Refrigerator Cabinets

WE INVITE CORRESPONDENCE

F. B. RILEY
320 Beaubien St. Detroit, Mich.



Enclosed Motor and Pump, Domestic Unit, Developed by Us for Domestic Electric Refrigeration Corp., N. Y.

H. R. VAN DEVENTER
INCORPORATED
342 Madison Avenue
NEW YORK

Specialists in the design and quantity production of electric and gas refrigerating units.

Investigations of new machines for prospective investors and manufacturers.

Tests on complete units, refrigerators, parts, and refrigerants.

Consulting services to manufacturers, costs systems and production plans that get results.

We specialize in pumps and are thoroughly advised as to the state of the art and the patent situation and can furnish satisfactory designs free from patent infringement.

Merchandising and advertising plans furnished based on accurate engineering and manufacturing experience and properly coordinated therewith.

Our personnel has over twenty years successful manufacturing and merchandising experience, and forms the only organization extant rendering a complete specialized service in this field.

REFRIGERATION PATENTS

Available and classified for ready reference, I have a very complete history of the published, unpublished, patented and non-patented art of refrigeration and can furnish therefrom accurate data respecting any new idea, or development.

I have contacts with engineers and attorneys all over the world specializing in refrigeration and can secure information from these and other sources having an important bearing on the validity and scope of many patents. I know the patent situation from 15 years practical contact therewith.

To those attempting to create patent situations I offer a specialized graphic charting service of inestimable value and can submit for purchase applications of interest from clients here and abroad which will aid materially in completing any situation in this field.

Engineers and Inventors having inventions to dispose of will find it advantageous to communicate with me.

Through associates abroad I am able to dispose of foreign rights to U. S. inventions and can initiate manufacturing and sales contacts, particularly in England and Germany. I have requests from concerns abroad wishing manufacturing rights to machines that are fully developed here.

In furnishing Reports, Opinions, etc., I bring to the work an experience of over twenty years as a successful manufacturer and engineer in addition to over fifteen years experience as a registered Patent Attorney.

H. R. VAN DEVENTER
342 Madison Avenue
NEW YORK